



Technical Standard Order

Subject: TSO-C11e, POWERPLANT FIRE DETECTION INSTRUMENTS (THERMAL AND FLAME CONTACT TYPES)

a. Applicability.

(1) Minimum Performance Standard. This technical standard order (TSO) prescribes the minimum performance standard that powerplant fire detection instruments must meet in order to be identified with the applicable TSO marking. New models of powerplant detection instruments that are to be so identified and that are manufactured on or after the date of this TSO must meet the minimum performance standards set forth in the Society of Automotive Engineers, Inc. (SAE) Aerospace Standard (AS) 8028, "Power Plant Fire Detection Instrument, Thermal and Flame Contact Types," dated April 1980, reaffirmed October 1984, as amended and supplemented by this TSO.

(2) Additions.

(i) In addition to paragraph 1.0, General Standards, of AS 8028, if applicable, all materials used must be self-extinguishing when tested in accordance with applicable requirements of Federal Aviation Regulations (FAR) Part 25, Appendix F.

(ii) In addition to AS 8028, Required Tests, the following test shall be conducted:

"With the system energized, crush the half inch section of the sensing element adjacent to one end of the sensor loop or the transponder between two flat plates, until the width of the sensor is reduced to 25 percent of its nominal diameter. No false warning shall result. Flame test 5.1.1 of AS 8028 shall be applied to the sensing element at the point most remote from the flattened section. The system shall warn within 5 seconds maximum unless the defect is revealed by the test of 3.5 of AS 8028."

(3) Environmental Standard. The conditions and procedures prescribed in Requirement and Technical Concepts for Aviation (RTCA) Document No. DO-160C, "Environmental Conditions and Test Procedures for Airborne Equipment," dated December 4, 1989, are to be used in lieu of RTCA Document No. DO-160 in SAE AS 8028.

(4) Computer Software. If the equipment design includes a digital computer, the software must be developed in accordance with RTCA Document No. D0-178A, "Software Considerations in Airborne Systems and Equipment Certification," dated March 1985. In accordance with RTCA/DO-178A, the applicant must submit a Software Aspects of Certification Plan (RTCA/DO-178A Document No. 14) for review and approval.

NOTE: The Federal Aviation Administration (FAA) strongly recommends that this plan be submitted as early as possible in the certification process. This will allow for early discussion and agreement between the applicant and the FAA on the software level or levels, the verification approach, and the documentation to be prepared and submitted.

b. Marking. In addition to the marking specified in FAR section 21.607(d), the following information shall be legibly and permanently marked on the major equipment components:

(1) Each separate component of equipment that is manufactured under this TSO must be permanently and legibly marked with at least the name of the manufacturer, the TSO number, and the part number.

(2) With regard to FAR section 21.607(d)(2), the part number is to include hardware and software identification, or a separate part number may be utilized for hardware and software. Either approach must include a means for showing the modification status.

(3) The software level or levels in accordance with RTCA/DO-178A.

NOTE: If multiple software levels are marked, then the installation instructions must clearly identify the software level for each function.

c. Data Requirements.

(1) In addition to FAR section 21.605, the manufacturer must furnish the Manager, Aircraft Certification Office (ACO), Federal Aviation Administration, having purview of the manufacturer's facilities, one copy each of the following technical data:

- (i) Operating instructions.
- (ii) Equipment limitations.
- (iii) Installation procedures and limitations.
- (iv) Schematic drawings as applicable to the installation procedures.
- (v) Wiring diagrams as applicable to the installation procedures.
- (vi) Specifications.

(vii) An environmental qualification form as described in RTCA/DO-160C.

(viii) Manufacturer's TSO qualification test report.

(ix) Nameplate drawings.

(x) The appropriate documentation as defined in RTCA/DO-178A.

(2) In addition to those data requirements that are to be furnished directly to the FAA, each manufacturer must have available for review by the Manager of the ACO having purview of the manufacturer's facilities, the following technical data:

(i) A drawing list, enumerating all the drawings and processes that are necessary to define the article's design.

(ii) The functional test specification to be used to test each production article to ensure compliance with this TSO.

(iii) Equipment calibration procedures.

(iv) Corrective maintenance procedures (within 12 months after TSO authorization).

(v) Schematic drawings.

(vi) Wiring diagrams.

(vii) The appropriate documentation as defined in RTCA/DO-178A.

d. Data to be furnished with manufactured units. Each recipient of one or more articles manufactured under this TSO, shall be furnished with one copy of the data and information specified in paragraphs (c)(1)(i) through (vii) of this TSO, along with instructions for periodic maintenance and calibration necessary for continued airworthiness of the article. In addition, a note with the following statement must be included:

"The conditions and tests required for TSO approval of this article are minimum performance standards. It is the responsibility of those desiring to install this article either on or within a specific type or class of aircraft to determine that the aircraft installation conditions are within the TSO standards. The article may be installed only if further evaluation by the applicant documents an acceptable installation and is approved by the Administrator."

e. Availability of Reference Documents.

(1) Copies of SAE AS 8028 may be purchased from the Society of Automotive Engineers Inc., Department 331, 400 Commonwealth Drive, Warrendale Pennsylvania 15096.

(2) Copies of RTCA Documents No. DO-160C and DO-178A may be purchased from the Requirements and Technical Concepts for Aviation, 1140 Connecticut, Suite 1020, Washington, DC 20036.

(3) Federal Aviation Regulations Part 21, Subpart O, may be purchased from the Superintendent of Documents, Government Printing Office, Washington, DC 20402-9325. Advisory Circular 20-110, "Index of Aviation Technical Standard Orders," may be obtained from the U.S. Department of Transportation, Utilization and Storage Section, M-443.2, Washington, DC.

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